LIFT - Local Inference in Massively Distributed Systems

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Abstract

As the scale of todays networked techno-social systems continues to increase, the analysis of their global phenomena becomes increasingly difficult, due to the continuous production of streams of data scattered among distributed, possibly resource-constrained nodes, and requiring reliable resolution in (near) real-time. We will present work from an on-going European funded research project: LIFT - Local Inference in Massively Distributed Systems. On the theoretical side, the project investigates novel approaches for realising sophisticated, large-scale distributed data-stream analysis systems, relying on processing local data in situ. A key insight is that, for a wide range of distributed data analysis tasks, we can employ novel geometric techniques for intelligently decomposing the monitoring of complex holistic conditions and functions into safe, local constraints that can be tracked independently at each node (without communication), while guaranteeing correctness for the global-monitoring operation. An application area where this leads to very interesting applications is the real-time analysis of human mobility and traffic phenomena. In this case, privacy concerns add another dimension to the problem. We present a number of case studies how the LIFT-approach can be used for efficient, privacy-aware analysis of human mobility.